

adjusted to a lower than optimum setting for a variable set of product parameters. The nature and gravity of the product quality damage depends on the product in question. It can be considerable, in particular for products such as confectionery, sugared almonds, chocolates and pharmaceutical tablets, which then inevitably leads to great product waste, up to inadmissible levels.

In the case of the abovementioned known conventional machines for printing products by means of linear pad printing the limitations in the case of significant product variations between the production series are summarized below.

The machine parameters such as image size, position of the image relative to the product, printing parameters of the ink, including medium, pigment, drying time, adhesion etc., and the size and shape of the pad, its hardness, the uptake depth on the cliché and the deposit depth on the product are in each case set for a set of products.

In addition, during the setting of the parameters of the machine, account can be taken of only slight deviations of the products and/or of the inaccuracies in the positioning of the product relative to the printing unit. In the case of a conventional pad printing machine it is not possible to adapt the machine parameters to the effective individual characteristics of the product such as shape, size, color, surface characteristics etc. All this results in a reduction in the average product quality in the case of products with considerable product variations between them, as a result of product damage, in particular deformation as a result of a too great pressure force on the product, on the one hand, and loss in quality of the printing as regards image, position, intensity and color(s), inter alia, on the other hand.

Eliminating these abovementioned limitations calls for a technological solution that cannot be reached in devices that employ the conventional method of pad printing.

Likewise WO 92/05960 A discloses a printing tampon having the same shortcoming as indicated above consisting of being applicable for printing objects with only slight deviations such as small differences in size, e.g. in the case of eggs, in particular series of eggs. The objects disclosed may only slightly vary in size. The tampon as disclosed which is provided for achieving this has a weakening which may consist in a joint part, e.g. a coil spring, arranged between the top part of the tampon and the tampon tip respectively. Besides, this document discloses a piece holder consisting in a container, more particularly the ordinary

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packaging container of the objects to be printed. Consequently, said piece holder is no part of the printing device as such and it is therefore not suitable for being used in the overall printing process of products having more substantial size variations.

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Object of the invention

The main object of the invention is to eliminate the above-mentioned drawbacks including avoiding damage to the quality of the end product during printing. To this end, one or more of the following measures must be taken as a solution to the problems and shortcomings of the existing systems, depending on the degree of product variation and the specific individual character of the products to be printed.

15 **Summary of the invention**

According to the invention, an adapted printing unit of the type defined in the main claim is therefore proposed, wherein the pressure on the products to be printed is limited in the case of products with significant product variations between them, thanks to said device.

Thanks to the specific arrangement of the secondary guide acting on the printing pad outwardly therefrom, an outstanding buffering of the differences in effective deposit depth between the individual products to be printed is achieved.

In particular, the following advantages are present compared with the existing devices. According to the invention, a printing device that is adapted to the type of product – partly flexible, but also brittle – is proposed. The device for the pad movement comprises in particular a set of elements that form, respectively in pairs, a double guide with, on the one hand, a primary conventional guide by means of which the main movement of the pad is carried out and, on the other hand, an additional secondary guide for buffering the differences in effective deposit depth between the individual products. This is an essential aspect of the system according to the invention.

Thanks to this specific combination provided in the device according to the invention for the pad movement, consisting of primary elements with a movement function and secondary elements with a buffer function, the pressure force on the product to be printed can be reduced and allowances are made for

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significant variations in the dimensions of the product. This means that the quality of the products can be guaranteed and a high capacity can be obtained by printing a number of items - with significant variations between them - per printing cycle.

5 According to a special embodiment of the device according to the invention, the abovementioned secondary elements are formed by elastic elements, preferably of the spring type, which are disposed axially relative to the movement axis of the pad.

10 According to a preferred embodiment of the invention, said device further comprises an adapted piece holder for the products to be printed, wherein the position and orientation of each product relative to the printing unit is brought into line with the one, which is necessary for printing the image at the envisaged position on the product. This means that undesirable friction between product and environment is reduced as much as possible, or even eliminated.

15 Significant product variations can also be compensated for partly by the abovementioned piece holder. The main advantages of the piece holder, as indicated according to a possible arrangement of it, are the avoidance of local pressure points on the products, during infeed, conveyance, printing and discharge, this being where there are significant variations in the dimensions of the products. The product can also be prevented from undergoing friction as a result
20 of stationary parts during conveyance, which can give rise to product damage.

According to an additional preferred embodiment of the invention, conditioning of the product and the environment is proposed, in this case the piece holder for the product, with regard to temperature, pressure, humidity etc., in order to eliminate product damage arising from not conditioning the environment.

25 According to a further preferred embodiment of the invention, conditioning of the substance to be printed on the product, such as ink, chocolate and the like, with regard to, inter alia, temperature, viscosity and color, is proposed, in order to keep the print quality constant in this way.

30 According to yet another preferred embodiment of the invention, an adapted device is proposed for the infeed of the product to and discharge of the product from the printing machine, with guarantee of product quality being retained. The fact is that the more fragile the product to be printed, the more complex the infeed and discharge mechanisms will be.

35 In the abovementioned first case of so-called natural product variations in a particular product series the device according to the invention offers a solution to the printing of the products with the retention of consistent product quality. In the

abovementioned second case of possible variations between series of products to be printed with the same machine, the device according to the invention offers a solution that drastically reduces the setting time of the machine and thereby also makes it economically practicable to print small series with significant variation
5 between the products.

Special features of this device are the possibility of integration in automatic or manual machines. The device can also be used for printing these products with several colors and/or on several sides.

Specific embodiments of the device according to the invention are
10 defined in further sub-claims.

The entirety of the claimed features, taken alone or in combination with each other, results in a set of devices that allow products with significant product variations, in particular pharmaceutical tablets and edible products, including chocolate, chocolates and sugared almonds, to be printed in several colors and/or
15 on several sides of the product without loss of product quality. Specific care is always taken here to ensure that the quality of the end product remains guaranteed. Quality in the broad sense is then determined by the retained quality of the product and the quality of the monochrome or multicolor printing, applied on one side or on several sides of the product.

According to an additional device for the printing device, the
20 conventional solid pad is replaced by a hollow pad. The shape of the pad and of the hollows, specifically for a particular product and image to be printed, result in a reduction of the pressure force on the product to be printed. This addition is all the more important in the case of great product variations, in combination with a large
25 printed image or otherwise, and the characteristics of the product with regard to deformation.

A combination of the two techniques, double guide and use of hollow pads, can be used for certain combinations of products and printed images. Moreover, these both devices permit simultaneous printing of several products
30 with significant variations between them.

This device can also be used for certain cases, in combination with one or more of the previous devices or otherwise, as a solution designed to compensate for product variations.

This invention also relates to a method for printing the
35 abovementioned products by means of pad printing, in particular by means of a device according to this invention.

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The method according to the invention therefore compensates for significant product variations by dividing up more specifically the printing cycle per se. After the specific measurement of the variable product parameter(s), for example dimensions and shape of the product, the settings of the printing unit are adapted in accordance with the measured characteristics. The individual parameters to be set comprise the uptake depth and deposit depth and also the shape and the effective hardness of the pad. By this method, optimum printing is obtained on an individual product basis.

Further features and characteristics of the method according to the invention will be defined in the additional sub-claims.

Further details and particulars of the invention will hereafter be explained with reference to the description hereafter of an exemplary embodiment of the device according to the invention by means of the appended drawings.